THE SPECTRUM OF HEALTH
PODCAST

# Podcast Session #74

## *The Air We Breathe and Covid-19*

With Dr. Stephanie Seneff

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**Dr. Christine Schaffner:** Hi everyone, welcome to the Spectrum of Health Podcast. I'm Dr. Christine Schaffner, and I wanted to introduce to you a series I did earlier this year called the Luminary Talks. I invited my colleagues, my mentors, and my friends to give us lectures and inspirational information during this very paradigm-shifting time, where I feel there's a huge opportunity to reframe how we look at medicine and illness, and empower each other. So I hope that you take this journey, and learn from these inspired luminaries and enjoy this series. I am just so grateful to introduce Dr. Stephanie Seneff, she's a dear friend and colleague, and Stephanie I think we met you maybe six or seven years ago when you were really just starting to be a leader, and a voice, and a pioneer with why we need to look at glyphosate, and why it's such an important part of recovery in someone's health, understanding all the mechanisms that glyphosate does to disrupt our patient's bodies.

**0:01:04 CS:** We're at this really pivotal time where I think education is the most important tool right now to empower us and to find a way out of kind of where we are. Dr. Seneff was so kind to be here with us and she's going to, like always, put so many pieces together. She's going to be talking about glyphosate, deuterium, and COVID-19, and for those of you who might be new to deuterium, we're going to talk about that, but we also did a talk with Dr. Petra Dorfsman and Dr. László Boros who are also leaders in this conversation, so please check out those talks as well. Dr. Seneff needs a much longer introduction than this, but I just want to give a short bio that Dr. Seneff is a Senior Research Scientist at the MIT Computer Science and Artificial Intelligence Laboratory. Her recent research interests are the role of nutritional

deficiencies, and toxic chemicals and disease with a focus on the mineral sulfur, and the herbicide glyphosate. So welcome, Dr. Seneff, it's just such a joy and honor to have you here today with us.

**0:02:05 Dr. Stephanie Seneff:** Thank you so much for having me.

**0:02:07 CS:** Well, like always, you're going to put so many pieces together, and I'm sure people are going to have to watch this recording a couple of times to take it all in, but why don't we just start with the foundation of this conversation, what is glyphosate, and why do you think it plays an important role in COVID-19?

**0:02:22 SS:** That's a big place to start, but these are all big places. It's really interesting actually to me, I've written now three different articles about glyphosate and COVID-19, because I think it's a central part of the story. And the reason actually is very interesting, because I think it has to do with the development of biofuels and particularly, perhaps possibly bio-diesel fuel and possibly the bio-gas, the methane, bio-methane gas. I'm not sure yet exactly which ones, but both of those are pouring into the environment in parts of the world where they're being actively developed, and it's very sad because cities are taking the initiative to really introduce bio-fuel with the hope of reducing the global climate change problem, because the claim is that with biofuel superficial, you reduce oil consumption, that's certainly true, because you're getting your oil basically from the bio-mass, which is the residue from the crops after you've harvested in many cases.

**0:03:18 SS:** Sometimes it's the oil after you've cooked, you try to use waste food or waste after we've harvested the food, so the plants themselves like

the wheat stalks, the corn stalks, the sugarcane stalks. You pile all those onto a barge and ship them down to a city and you run them through a factory where they come out as oil, and diesel oil, or as gas, bio-methane gas. And so it sounds really good that you're sort of getting your gas from renewable sources because the plants can grow every year, you can get some more gas that way, or your diesel fuel for the vehicles. And so certain cities in the United States have played a leadership role like New York City, and New Orleans, and Boston, unfortunately where I live half the year, and those cities are all getting hit hard by glyphosate...I mean by COVID-19. People are getting really sick when they get it, so I think COVID-19 is not necessarily a bad disease, it's more like the flu, as long as you don't have glyphosate running around your veins.

**0:04:18 SS:** But especially if you're breathing glyphosate from the air, which is what I think is happening. And I have no proof, it's all theory at this point, no one's done the research to see if there is glyphosate in the bio-diesel fuel or if when you burn the fuel with an engine that's not well-tuned, whether you spew out glyphosate because you have nasty fumes from diesel vehicles like old buses and things like that. New York City has 11,000 buses that are running on bio-diesel fuel. So what I'm thinking is happening, is that the glyphosate is in the air, people are breathing it in the city, it's poisoning their lungs, and then their lungs are very sensitive to the virus, and then you get a whole really interesting cascade that actually relates to deuterium, which we're going to get into later, with the way in which glyphosate disrupts your body's ability to fight off the virus.

**0:05:09 CS:** That's interesting. I hadn't thought about glyphosate as a route that we get exposed through inhalation, but that makes perfect sense as

you're talking about it. You shared it's making our bodies more vulnerable, obviously by having the glyphosate. Do you have a sense of what it's doing in the lung to make the lung a little bit more vulnerable to COVID? We've been tracking surfactant and how that might be compromising some people but any insights or theories there, Stephanie?

**0:05:37 SS:** Absolutely, and in fact, it's very clear from the studies on vaping, so people who smoke e-cigarettes there was...I knew about this lung disease that was showing up in e-cigarette smokers before COVID-19 even hit, and I was exploring that and I was thinking, "I bet you this has something to do with glyphosate", and I sort of hit pay dirt because it was sort of lucky that I happened to be exploring that just before COVID hit because I found out that the e-cigarettes are produced from glycerol. The glycerol's a major component, that's what burns in the e-cigarettes. A huge amount of glycerol comes out of the biofuel industry as a leftover by-product. So glycerol is dirt cheap these days, because there's lots of it. The biofuel industry is really ramping up, that's another thing the last few years, so it's a new phenomenon of having all these bio-fuels being spewed out. The toxic chemicals from the bio-fuels are being spewed out into the air, a new phenomenon over the past few years.

**0:06:32 SS:** But the glycerol, having all that glycerol I think is what probably inspired them to come up with e-cigarettes in the first place. They had this by-product. What are they going to do with it? One of the things they could use it for is to make these e-cigarettes. And so the people who are smoking the e-cigarettes are getting this weird lung disease that looks exactly like COVID-19. It's quite remarkable. It has the slight fever, it has a dry cough. So you don't have the runny nose, which is a characteristic feature of COVID-19, and of course, you have the breathing problems. And then in fact when you look

at the lungs, a fascinating study that I really lean on for my story was on mice that were exposed to fumes from vaping for three months. They were exposed to these fumes and then they infected them with a flu virus.

**0:07:17 SS:** They were predicting that the fumes would cause them to be more sensitive to the flu virus. So this is a really, really perfect experiment for showing the COVID-19 situation. And they found that these mice responded much more dramatically to the flu virus, producing lots of inflammatory cytokines, all the things that we're seeing in the people who are being taken down by COVID-19, an incredible overreaction of the adaptive immune system to the virus. And the reason is because the innate immune system is crippled by the glyphosate. And the reason why it's crippled is because of actually collagens, collagen-like proteins that make up part of the surfactants of the lungs, there's surfactant A, B, C, D.

**0:07:58 SS:** And surfactant A and surfactant D, those two have these collagen-like stalks, that are long sequences of GXY GXY GXY in the protein sequence, the G is glycine. And my whole theory is based on glyphosate substituting for glycine during protein synthesis so that I believe that glyphosate is substituting for the glycine in collagen. I think that's why we have an epidemic and joint pain and whatnot. But also in these collagen-like proteins that are surfactants in the lung, these are very important for trapping viruses so the natural immunity of the lung is unable to trap the viruses efficiently because A and D are not working. And that is exactly what they saw in this study of the mice. They saw that A and D were broken by those fumes.

**0:08:42 SS:** They didn't mention anything about glyphosate. They weren't thinking of it at all, I'm sure, but I was. And the other thing they found, which

was really fascinating is that the macrophages, those are the immune cells that accumulate in the lung in response to the virus, also accumulate fats. They piled themselves full of fatty acids. So the fat accumulation in the macrophages in the lungs, that is extremely similar to what happens when you expose mice or rats to glyphosate orally. There was a recent study that looked at rats exposed to glyphosate orally at levels that were below regulatory limits. So very low-level exposure to glyphosate and they showed that the glyphosate caused fatty liver disease. It caused macrophages in the liver to store fat, which is exactly what's going on with the lungs with exposure to the fumes from the vaping cigarettes. So that really makes sense to me that it's causing in the lungs the same thing that it causes in the liver if you get it orally from the air, it causes that same effect in the lungs, it causes them to trap fats.

**0:09:36 SS:** I think that's because of its disruption of sulfate, because you have to store cholesterol with fats if you can't release it, and you can't release cholesterol if you don't have sulfate. I talked a lot in my research, even before glyphosate, about cholesterol sulfate and its importance to the body in terms of delivering both cholesterol and sulfate to the tissues. And the sulfate pathway is I think just utterly destroyed by glyphosate in multiple ways. The sulfate transporters are reduced, sulfate synthesis is disrupted, sulfate activation is disrupted, sulfate transfer from one molecule to another...I feel like there's disruptions at every step of the way with sulfate, with glyphosate. I believe that sulfate deficiency systemically is a primary factor in many, many diseases that are going up in exact step with the rise in glyphosate usage on corn crops.

**0:10:26 CS:** You're putting so many pieces together for me, especially around the fats in the macrophages due to those sulfate deficiency. And then we'll go down this rabbit hole a little bit in a moment about the extracellular matrix and thinking about all those sulfated proteins and things that are needed for communication and all of that so that, that's fascinating. Collagen is the most abundant protein, right, in our body?

**0:11:00 DS:** By far, 25% of our protein is collagen.

**0:11:02 CS:** So if we have a fundamental disruption in the most abundant protein in our body, of course, it's going to break down so many body systems, and that's why you have been able to pull together that every system is affected by glyphosate in your research. And so that's super insightful. Part of this conversation is we want to share your recent research and you putting together the pieces around deuterium. This is still a really new topic I think to a lot of our audience, even though they might have listened to the previous lectures, so can you give us a basic understanding of what deuterium is and why you feel it's significant for human health?

**0:11:42 SS:** Yes, and I can also say deuterium is a new topic for me. I only first learned about it last December and I totally jumped on it when I heard about it from László Boros, the same person that you've interviewed. I love him, he's so great and there are so few people that are looking at deuterium. The West is sort of ignorant of deuterium, I think. Increasingly people are becoming aware of deuterium depleted water as being a potential therapeutic for cancer and other diseases. So that's starting to get people to become aware of deuterium. I knew that deuterium was heavy hydrogen but I didn't really know anything about its effects on health until László informed me

about that. And he had a wonderful paper, which I have read multiple times now. It's so full of information. It's in Medical Hypotheses and it's just so fascinating. It was fortunate that I already knew so much about glyphosate and about glyphosate's effects on proteins and specific proteins that would be affected by glyphosate given that it substitutes for glycine.

**0:12:38 SS:** So I had in my brain a whole list of proteins, and it immediately became clear to me that deuterium and glyphosate are a toxic, toxic mix. Deuterium is heavy hydrogen. It's a proton with an extra neutron which makes it twice as heavy as normal hydrogen. It's a natural element and it's found in seawater, for example, at 155 parts per million. So that sounds like a small amount in the water but, and László talks about this, when you look at the level of deuterium in the blood at that level, 155 parts per million, that's going to be six times as high as the level of calcium in the blood. So it's not a trivial amount when you think about how you don't really have a lot of parts per million when you're talking about water because of hydrogen...So much hydrogen in the body that 155 parts per million is still a lot of molecules, a lot of atoms of deuterium. And so they have the potential to do something interesting, and biology has actually made use of deuterium in a really, really interesting way. And deuterium is different from hydrogen in its physical properties.

**0:13:40 SS:** I would say there are two things that are especially interesting about that, one is that deuterium binds much more strongly to other atoms than hydrogen does. It hangs on better to where it is and doesn't let go as well as hydrogen does number one. And number two, there's a very fascinating biophysical property of hydrogen, of protons, called proton tunneling. It's

very, very difficult biophysics literature that I've been reading and trying to understand. But it's really fascinating, proton tunneling, and the protons can actually tunnel...Basically, they have to climb a hill to react. A proton is sitting on one molecule, it needs to go over to this molecule over here, and there's an enzyme that's wrapped around that tries to push those two to get close together, so that the proton can hop over to the other side and change the biochemical structure of both of those molecules by transferring the proton from one to another, and that's something that lots and lots of enzymes do.

**0:14:32 SS:** And many of those enzymes do it using proton tunneling. So there's a hill you have to climb to get over a sort of energy barrier, and then you can come back down to the other side, but the tunneling goes right straight through the hill like there's a tunnel in the hill, and the proton can hop across without having to go over that energy barrier. And protons are much, much better at proton tunneling than deuterons are, and so that becomes very, very important to biology because biology wants to have protons, not deuterons on those molecules when it wants to transfer them from one molecule to another. And that turns out to be an absolutely fascinating aspect of all kinds of chemical reactions that I had not appreciated until I started to look, and in particular, there's a class of enzymes called flavoproteins or flavoenzymes, and they bind something called flavin, and flavin is a very, very interesting molecule that helps to facilitate the transfer.

**0:15:22 SS:** It sort of hangs onto the hydrogen temporarily, and then ships it over to the other guy. You bind the flavin to the enzyme, and you have your two substrates, and the hydrogen hops across to the flavin and it goes over to the other side. So that whole thing is really very, very intricately designed in these enzymes, these flavoproteins, to be able to select for hydrogen. So if

there's a deuterium that is on a molecule, it won't go. If the enzyme won't choose a molecule that has deuterium, it'll choose one that has hydrogen, and the result is that it produces a product that has low deuterium at that place where it stuck that hydrogen atom. It's really fascinating, and it turns out to really, really matter, because when you start to look at the mitochondria and all the enzymes that take place in the citric acid cycle, which is what generates ATP, which is the energy currency for the cell--really, really important. And the mitochondria absolutely want hydrogen and not deuterium in the inter-membrane space, and they work really, really hard to get that using all these flavoenzymes that pump hydrogen into the inter-membrane space, but not deuterium.

**0:16:24 SS:** So you end up with what László calls metabolic water, which is water that's produced from oxygen so that the whole citric acid cycle oxidizes oxygen...Produces water from oxygen, and by oxidizing the nutrients like sugar, it produces water. And that water that it produces is deuterium depleted because of all these flavoenzymes. It's severely deuterium depleted, and so you get this really, really beautiful water inside the mitochondrial intermembrane space with all those hydrogen atoms as protons that are going to go back out through the ATPase pump, which is the enzyme that actually makes the ATP, that's super, super important. That pump hates deuterium. And that's what László has been talking about, is this whole idea that the mitochondria absolutely want low deuterium in the intermembrane space in order to be able to make ATP without basically breaking the enzyme itself or spewing out oxidative damage, and not being able to make enough ATP, using up more energy; all these things are going to be bad if you've got too much deuterium inside the intermembrane space.

**0:17:31 CS:** Then for people who probably need to listen to this again, that's just fascinating, what's happening is we're overexposed to deuterium, probably more than was naturally supposed to occur?

**0:17:46 SS:** Two things are going to happen. One is the plants may be producing products that are not as deuterium depleted as they should be. Fats, in fact, are typically much lower in deuterium than other kinds of foods, it's quite interesting. The whole fat synthesis process tries hard to choose protons over deuterons to make the fat. And so, for example, László has measured deuterium levels in various foods, and he found the lowest levels in butter and lard. And those are foods that I love, so I was like, "Okay, yay, that's good." I believe in a high-fat diet and he says a high-fat diet, well, that's a low deuterium diet, maybe that's why it's good. And that's really quite fascinating to think about that as possibility, maybe that's the reason.

**0:18:29 SS:** Also, deuterium in water. I found a paper that was quite fascinating, it looked across the United States, they could actually know how much deuterium there was in the water supply in different states. You could actually apparently get that information and so they looked for correlation between deuterium in the water supply and depression, and they found a striking correlation, that people who had water that was low in deuterium had less depression. I think that may explain why Iceland does so well, Iceland has incredibly high life expectancy, people are really healthy there, people are studying their genes to figure out, "Jeez, these people have these fantastic genes." I think it might just simply be their water because they're getting glacier water and glacier water's naturally depleted in deuterium.

**0:19:14 CS:** Wow, yes.

**0:19:14 SS:** So it's quite interesting, we're probably getting too much deuterium in our diet because our plants that are being exposed to glyphosate are making foods that are higher in deuterium than they would normally do. I haven't told you how glyphosate messes it up yet, but that's quite interesting also. So maybe I should tell you that now.

**0:19:30 CS:** For people who want to learn more about deuterium, Dr. Boros is on a lot of podcasts, we interviewed him. He's putting a lot of information out there, so please check him out.

**0:19:43 SS:** Ye, he's great. I really follow him, he's right up there with Dr. Zach Bush, he's another one that I really love. There's some great people out there, and Zen Honeycutt of course, fighting politically for getting rid of glyphosate. So there are some wonderful people out there that are helping to get this message out because it's so important. But anyway, the glyphosate and the deuterium is really, really interesting. I believe glyphosate substitutes for glycine during protein synthesis, this is something I've been screaming from the rooftops, but everyone's saying I'm crazy, so you can decide who you want to believe. But when you look at Monsanto's own data, it becomes very clear that that's what's going on specifically with the enzymes that glyphosate famously disrupts, which is EPSP synthase in the shikimate pathway in the plant. That's a super important enzyme because the pathway produces aromatic amino acids; tryptophan, tyrosine, and phenylalanine. And those aromatic amino acids are part of the building blocks of proteins, but they're also precursors to all kinds of important molecules, all the neurotransmitters. In fact, the flavin that these proteins bind to comes out of the shikimate pathway, that's riboflavin.

**0:20:50 CS:** Wow.

**0:20:50 SS:** So riboflavin, there's these B vitamins, niacin and riboflavin, and niacin produces something called nicotinamide adenine dinucleotide, NAD. And if you've looked at anything with respect to metabolism, you'll see that NAD is all over the place, and it's very, very interesting. NAD is a hydrogen...It's a depleted hydrogen, depleted hydrogen carrier. It actually hangs on to a hydrogen that's depleted, that's not deuterium, which was put there by an enzyme, a flavoenzyme that's able to select for hydrogen, and it hangs on to that hydrogen and then when it goes to another enzyme and that hydrogen gets taken off and put on another molecule such as a fat, you're going to make a low deuterium fatty acid. So you're going to produce low deuterium fat because you have low deuterium NAD, but if you don't have NAD because glyphosate is disrupting the ability to make it, then you're going to have all kinds of deficiencies and bad synthesis and whatnot.

**0:21:43 SS:** So one thing is just simple deficiency, FAD and NAD both come out of that shikimate pathway, and both of them are super important for these enzymes that deplete deuterium. So right there, you've got a huge problem, but it's not just the depletion of those two, it's also the disruption of the enzyme itself that glyphosate is causing, I believe. And this gets into the way glyphosate disrupts EPSP synthase, which is quite fascinating. Monsanto researchers have determined that glyphosate messes up the binding of PEP, so the enzyme is EPSP synthase and it uses phosphoenolpyruvate, PEP, as a substrate. And phosphoenolpyruvate obviously has a phosphate, because there's phospho, that first word is a phosphate. Phosphate binding is a very important part of the story, and there's lots of enzymes that bind phosphates,

but both NAD and the FAD have two phosphates in them, they're a dinucleotide with two phosphates connecting the two nucleotides together. They're like ATP actually, they have the two phosphates in the middle, that bind to the enzyme at a phosphate-binding site, just like the phosphate of PEP binds to the enzyme at a phosphate-binding site in EPSP synthase, which is the one glyphosate disrupts. People might be losing me at this point, but I'm trying make it simple.

**0:22:55 CS:** They'll listen to this again, but this is fascinating.

**0:23:00 SS:** It's so fascinating. EPSP synthase binds the phosphate of PEP at a site where it has a highly conserved glycine residue, and that glycine residue, you can mutate the enzyme and you can turn it into alanine. Glycine is the smallest amino acid. Glyphosate is a glycine molecule, except that it has extra stuff stuck onto its nitrogen atom. And glycine is essential in many, many different enzymes, glycine is essential to make that enzyme work properly. And in particular, in these flavoproteins that are able to select for deuterium, they bind NAD and FAD, and both of those have these two phosphates in the middle. And the place where they bind those two phosphate, it has a motif, they call it a motif, a sort of typical pattern that shows up in all these flavoenzymes, which is called GXGXXG motif, that's got three glycines and the Xs are wild cards.

**0:23:53 SS:** So that motif, the binding site requires three glycines and all those enzymes that have those that bind to phosphate in NAD and FAD have those three glycines at that spot. And every one of those glycines is susceptible to glyphosate substitution. And glyphosate likes to substitute for glycine, specifically at places that bind phosphate, because glyphosate has this

methylphosphonate hanging off of its nitrogen atom, it needs someplace to go. So if the enzyme is geared up to bind phosphate, it has to have room for that phosphate ion to fit, and that gives glyphosate plenty of room to slap its methylphosphonate into that spot that's supposed to be where the phosphate goes. So the enzyme is happy to put glyphosate there when it assembles because it has room for that piece, but when it's done, the enzyme no longer works because it can't bind phosphate anymore, glyphosate is in the way. I think all those flavoenzymes are getting disrupted by glyphosate, in the same way that EPSP synthase is getting disrupted.

**0:24:51 SS:** They've designed those GMO Roundup Ready crops by just swapping in alanine for that glycine, and then all of a sudden the enzyme is completely resistant to glyphosate toxicity. So it's screaming at them that glyphosate is substituted for the glycine at that site, they know that if they replace that glycine, glyphosate no longer works, but they don't say that the reason why is because glyphosate's substituting for that glycine. They won't say that. I think they know that, but they know that if we know that, it's game over for glyphosate because it's so devastating. Glyphosate has a unique mechanism of toxicity that's absolutely unique to glyphosate, I don't know of anything else that replaces glycine during protein synthesis. There are many toxins that replace amino acids. They're called amino acid analogs of existing amino acids that cause serious diseases like ALS and metabolic disorders. Chris McCandless, of the book Into The Wild, he was trying to live off the wild and he was eating these wild potatoes. He was eating the seeds of these wild potatoes, and those seeds had a toxin in them that was an aromatic. It was an amino acid analog of arginine. That's an amino acid. So that's another one of the amino acids in the body. So this amino acid analog in these seeds killed him. Basically, it gave him metabolic defects such that he starved to

death. And there's also another amino acid analog of proline that's associated with multiple sclerosis. And then there's an amino acid analog of serine. In Guam, they had this big problem after World War II with these people getting ALS, a weird kind of ALS, and they attributed that to an amino acid analog as well. In other words, there are these known amino acid analogs that cause toxicity by doing exactly what I think glyphosate is doing. But Monsanto denies it. They say it's absolutely impossible, that I'm ridiculous. That's where we are right now. We're in this battle where it's me against the world because nobody else seems to be willing to believe it.

**0:27:07 SS:** But when you do believe it, then all of a sudden everything makes sense. And in fact, glyphosate has been shown to suppress a whole bunch of enzymes. I wrote them down here because I just wanted to make sure which ones they were. But there's an NADH dehydrogenase and it suppresses E. Coli. Glucose 6-phosphate dehydrogenase, succinate dehydrogenase, ferric reductase, and cyt reductase. All of these enzymes, reductases, and dehydrogenases, they're pulling hydrogen off of one thing and putting them on something else, and they're doing that with the deuterium depletion in mind. And they're all disrupted, but they're all suppressed by glyphosate. That's been shown in various studies that I've collected. And these enzymes are all binding phosphate; NAD and FAD, they're binding phosphate. And they've got this GXGXXG motif there, and it's getting messed up. So they're not working properly and it's devastation. When you look at, for example, G6PD, that's the one in the red blood cells. It's huge amounts of G6PD in the red blood cells that keep NADPH supply to help out glutathione. If glutathione doesn't have enough NADPH, you get oxidized glutathione.

**0:28:14 SS:** The liver has a huge problem today in today's world with oxidation damage, because there's not enough reduced glutathione, and the reason is because G6PD is getting disrupted by glyphosate in the red blood cells. It's not supplying the reducing power for the glutathione to come back after it's reacted. Glutathione mops up reactive oxygen species, protects you from oxidative damage, turns into GSSG, which is this glutathione disulfide. It's the oxidized form of glutathione. And then in order to get back, it needs that NADPH, that's not being produced by G6PD. And we have a lot of mutations in G6PD. That's the most heavily mutated protein in the body. I suspect it's under pressure because it's so damaged. I believe there's a mechanism in biology by which an enzyme becomes more heavily mutated when it's under stress.

**0:29:05 SS:** I suspect there's a mechanism that can do that, because I'm seeing that enzymes that are predicted to be under stress from glyphosate have a lot of mutations. So the enzyme is trying to find some way to be. For example, get rid of that glycine. If it could change it into alanine and still make it work, then you'd be good to go. And all those mutations are causing terrible problems because they were a really bad idea, but you don't know until you've tried. That's how evolution works. You say, "Okay, let's try this. Let's try that. We've got to find a way to get around this problem." And eventually, you find a way and that person does very well, but in the meantime, lots of people get severe diseases from genetic mutations.

**0:29:40 CS:** This is really what I believe is the definition of epigenetics, how these environmental pressures are changing transcription and configuration of these enzymes that are going to reduce the efficiency or even inactivate such important molecules that we need for our health and well-being. You're

putting so many things together for me. I didn't know about the riboflavin and the niacin piece of the shikimate pathway, those are building blocks for these key enzymes. And then they also have glycine as part of the building block for those enzymes, so then they're getting glyphosate...

**0:30:15 SS:** Double hit.

**0:30:16 CS:** Yes, so they're getting this double hit, the nutritional deficiencies plus the glyphosate disruption is really paralyzing these enzymes and creating inefficiency. And then also, the deuterium load.

**0:30:27 SS:** Exactly.

**0:30:27 CS:** Using deuterium rather than hydrogen when it's a hydrogen or a proton shuttling mechanism in the body to turn things on and off. Again, I'm over-simplifying everything, that we're just hit from all these angles. When we see the patients we see and these patients have tried a lot of things and they've been sick for so long, and they're really sick. When you hear something like this, you're like, "Wow."

**0:30:48 SS:** No wonder, right? My conclusion is you really can't do anything better than get rid of the glyphosate. That's what you have to focus on first. Get rid of the glyphosate, and everything else hopefully will follow. And of course, people get into a situation where sulfur's not working. A lot of people have sulfur sensitivity problems and that's because glyphosate is messing up sulfite oxidase, which forces sulfite to be toxic. Sulfite's very reactive and normally, it gets oxidized to sulfate. I think that's getting messed up by glyphosate. And also the sulfite reductase, similar to a sulfite reductase that makes

methionine out of sulfate. That's been shown to be disrupted in E. Coli in plants as well. So the methionine deficiency shows up in these plants when they're exposed to glyphosate.

**0:31:33 SS:** Methionine is the core sulfur-containing amino acid that's the base of all the organic sulfur in our body, so we can't make methionine. We depend on our gut microbes to make it for us, and they're going to make it with an enzyme that gets busted by glyphosate. So instead of making methionine, they end up reducing the sulfite to hydrogen sulfide gas and you get all these problems with bloating and hydrogen sulfide, even toxicity, because there's so much hydrogen sulfide gas. That can cause brain fog, because the hydrogen sulfide goes right up to the brain. And hydrogen sulfide is a hibernating molecule. It causes hibernation. So it basically causes you to get into a brain fog situation, because you've got all this hydrogen sulfide that's coming out of your gut microbes because they can't make methionine. Instead, they make hydrogen sulfide.

**0:32:18 CS:** That's the gut-brain connection right there, right?

**0:32:20 SS:** Yes, it's really interesting.

**0:32:22 CS:** Brain fog is a big symptom that a lot of our patients have. Before we tie this into COVID, I think there are some questions and I would love to hear your perspective on, about how to get the glyphosate out of our bodies. So avoiding exposure is number one, right? Whenever we're trying to eliminate a toxicant, we want to avoid exposure. I'm just curious about maybe your research or your knowledge of testing and half-life of glyphosate? I'm happy to share kind of what we've put together as glyphosate detox protocols, but

I'm just super curious what your recommendations are and your thoughts at this point are?

**0:33:00 SS:** Yes, I have some ideas, of course, but I'm not a clinician, so I listen to people like you to try to figure out what's working and what's not working, but I've heard fulvic acid and humic acid which is organic matter from the soil which are binding molecules, they're complicated sugar chains, quite fascinating. And they bind to lots of toxic chemicals, and they also have enzymes embedded in them that are very sophisticated, enzymes that have a sort of generic capability to break down lots of toxins. And so there's a hope that those enzymes that are bound to the fulvic acid, humic acid, could be able to break it down. So what I think ideally you'd want to have microbes growing in your gut that can break down glyphosate. And there are only a few. Most of the microbes don't know how to break that C-P bond so that's one reason why glyphosate often just sticks around. They'll just go right straight through and out the feces.

**0:33:46 SS:** So, for example, cow manure, you know of course organic agriculture uses cow manure and the cow manure doesn't have to be organic. So you're putting glyphosate into the organic food that way when you use cow manure that's coming out of cows that are getting heavy exposures to glyphosate, it doesn't really break down very easily but there are enzymes that do break it down, and there are microbes that have those enzymes, and one that I found was Acetobacter. And that really raised my eyebrows because I thought, "Oh, Acetobacter, that's a very common microbe in fermented foods," like apple cider vinegar and sauerkraut. So I try hard to eat fermented foods for that reason. Even possibly in yogurt, so all of these fermented foods are likely to have Acetobacter. And those Acetobacter may, it's not clear for

sure they're the species that can, but they may be able to break down the glyphosate enzymatically. I think that would be fantastic if you could kind of get your gut colonized with some microbes that are capable of breaking down glyphosate enzymatically. That'd be really great because then you could really clear it easily. There's also non-enzymatic ways to break it down which are interesting, and that's one thing very fortunate about the water supply.

**0:34:49 SS:** I think the municipal water supply, they typically use chlorine-based products, either chlorine or chlorine dioxide in the water supply to kill microbes. They're using it mostly to kill microbes and make the water safe. It turns out they also break down glyphosate. I know Kerri Rivera, she's a friend of mine, she's had an amazing success story in reversing autism in over 600 autistic kids. She treats thousands of kids around the world. She has a really interesting protocol that includes chondroitin sulfate and Vitamin D, so she's including things that I would expect to be beneficial for autism. But she also includes chlorine dioxide as a major part of her treatment program. And she gets a huge amount of flack for that because they're saying, "Oh my god, bleach." So it's very frustrating because I don't know of anyone else who's had that kind of success with autism, so I have to pay attention to that because I'm so interested in solving the autism problem.

**0:35:47 SS:** And I've met these kids. They seem normal. I mean it's amazing these kids that have had their autism reversed. It really is reversed, and so it's good news that the autism brain is not necessarily destroyed. It's only in some kind of a hibernation state probably because of that hydrogen sulfide gas, because a major, major problem in autism is sulfate. And glyphosate is messing up the sulfate so if you can get rid of the glyphosate, you can really help the autistic kids, and I suspect that chloride is doing something more

than that. I've actually studied it because chlorine dioxide is a very interesting oxidizing agent that specifically oxidizes sulfur. It's specific to sulfur. It's quite, quite interesting, unlike chlorine. So the chlorine is toxic, there's no question, but chlorine dioxide, it's not really very toxic. I mean, obviously, if you take a ton of it, you'll get sick, like anything else. Salt is toxic too if you take too much, or even oxygen, for example. Oxygen is highly reactive but we still use it because we can't live without it.

**0:36:44 SS:** And to some extent, that's true with the chlorine dioxide because it oxidizes to hypochlorite, which is something that the macrophages produce naturally to try to kill, keep the microbes in check. So it's sort of helping the macrophages to fight off the infection and typically you've got all kinds of pathogens overgrowing in your gut because glyphosate is messing up your beneficial bacteria. So that's one of the problems you have with autism is these pathogens, and the chlorine dioxide can help to kill them off, but the really interesting thing is that chlorine dioxide breaks down glyphosate. So your water supply, I think it's going to be pretty safe if it's gone through a municipal process at the water treatment plant. Your water supply, it's going to be pretty safe because I think it's going to wipe out the glyphosate. But then when you drink this chlorine dioxide, very low concentrations of chlorine dioxide, I think it's helping to break down the glyphosate in your body. In the oral cavity like in your mouth and before it even gets to the stomach, it's breaking down the glyphosate.

**0:37:38 SS:** I have a suspicion that it's also oxidizing sulfur, which is super important for producing sulfate. And in fact, I wrote a paper before I even knew about glyphosate. I wrote a paper about taurine. Taurine is the only sul-

fonated amino acid. It's a really unusual amino acid. It doesn't go into the proteins at all but it gets stored in high concentrations in the brain, in the heart, and in the liver. Taurine gets stored in high concentrations and when you have seizures, the Taurine gets released from the brain, and I believe it gets shipped to the liver, taken up by the liver, conjugated to bile acids, shipped over to the gut microbes, and then the gut microbes oxidize the taurine to sulfate, which is really, really interesting. I think you're relying on your gut microbes to supply sulfate through taurine, through storage taurine under conditions of emergency. And that oxidation of Taurine to sulfate by the microbes is probably messed up by glyphosate. I've seen, for example, E. Coli has huge suppression of the proteins that take taurine in, in the E. Coli. Several different proteins that import taurine get totally busted by glyphosate in a study that I read.

**0:38:41 SS:** They're not taking the taurine up probably because they can't oxidize it to sulfate and they can't because of sulfite oxidase being messed up. So I think there's a lot going on with the gut microbes getting messed up in their ability to convert taurine into sulfate, but the chlorine dioxide will help to do that because it converts taurine into taurine chloramine. That's well known actually. Hypochlorite converts taurine into taurine chloramine, and in fact, people have argued that one of taurine's roles in the body is to protect from hypochlorite that's released by the macrophages to fight the infection, and the taurine then picks up that hypochlorite and makes taurine chloramine which prevents other kinds of damage that could happen if that taurine wasn't there. But then the taurine chloramine is much more reactive than taurine, so it's easier to turn it into sulfate. So it's kind of a really cool system, but I think it's getting messed up by glyphosate.

**0:39:31 CS:** That's fascinating. We use a lot of taurine with a lot of our patients who have a stagnation in their liver and gallbladder and a lot of thick sludgy bile, as bile is so important for digestion and elimination. That makes me think of all these other things, and we've been, Stephanie, using hypochlorous in the office. We've actually have a local company right down the street from us called Briotech, and they have found a way to stabilize hypochlorous.

**0:40:00 SS:** Oh, that's fascinating...

**0:40:04 CS:** Yes, we've been using it in my office as a spray and we can use it as a spray, ingest it, use it as a dental rinse, so we've been using that. Obviously, chlorine dioxide and MMS have been politically kind of this whole...

**0:40:18 SS:** They're totally a political wildfire, yes.

**0:40:19 CS:** Yes. So we've been having to navigate that and treatment of patients, the CDS and chlorine dioxide solution has been a COVID treatment for people who go down...

**0:40:28 SS:** I know, including Trump, right?

**0:40:32 CS:** Yes. It's interesting what comes out of his mouth, and we're like, "Wow, we use some of that stuff," right? But yes, that's really interesting. I had never heard that it's able to get rid of glyphosate.

**0:40:47 SS:** What she thinks is essential for the autistic kids, she said that she treated thousands of kids and many of them, the mother says, "You know

what, I'm not going to use the chlorine dioxide because there is so much controversy. I'm not going to use that. I'll do everything else, but not the chlorine dioxide." Not one of them has had their autism converted, not one, and there have been 600 conversions, all of them use chlorine dioxide. So she thinks it's an essential part of her treatment, which is why I feel I have to speak out about it. I know it's very dangerous politically to speak out about chlorine dioxide because it's been so politicized. It's just crazy because it's also very, very cheap, and that's why pharma doesn't like it, but anything cheap that works, it's like, "Oh my God, we've got to get rid of this," right?

**0:41:26 CS:** I know, it's a crazy world we live in, but I'm grateful for you sharing that mechanism, because I think education is empowering, so if we're all equipped to be able to speak confidently and scientifically about why these things work, then it's a whole different story.

**0:41:43 SS:** Exactly, that's why I needed to search deeply with chlorine dioxide because I'm like, "Oh my God, this stuff works, I've got to figure out why." And in fact, the chloride channel, I think it's also susceptible to glyphosate. The chloride channel, which is essential for the stomach to produce stomach acid, and that channel has an essential glycine residue, and if you replace that with a molecule of amino acid that looks like glyphosate in terms of being negatively charged and bulkier than the glycine, then the chloride can't get through. So you're going to block the chloride movement through the channel, which is going to prevent the stomach acid from being produced. I think there's some of that going on as well, with glyphosate messing up the chloride channel. So then you sort of need chloride to help you out with that. We need more chloride if the channel's not working well, you have to boost the supply.

**0:42:31 SS:** So I can think of a lot of reasons why chlorine dioxide would be useful, particularly it's so interesting that it oxidizes specifically sulfur, and that taurine is available to catch that oxidation. That's because it's actually used naturally by the immune cells to fight the microbe. So the body knows how to handle hypochlorite because it's something that's part of biology, a lot of these crazy drugs that they feed autistic kids, these antipsychotic drugs, those are so horrible and they're not natural at all. The body doesn't know how to use them properly, and they cause all kinds of side effects, really devastating side effects. There's a huge list of side effects from these drugs that are being given to autistic kids in large numbers. I think it's just horrible. There's nothing about chlorine dioxide compared to what's going on with those drugs that the pharmaceutical industry is handing out like candy to the autistic kids. It's really amazing that they're able to put such a big message out about chlorine dioxide being toxic and yet they're perfectly fine with these antipsychotic drugs, it just doesn't make any sense at all.

**0:43:33 CS:** I think it's really through your work that they've shown that the MMR does contain glyphosate and you put some pieces together.

**0:43:42 SS:** Absolutely.

**0:43:42 CS:** So this whole story of vaccine injury, then the glyphosate exposure and then chlorine dioxide, you know, working. Do you mind sharing just a nugget about how you found that glyphosate was in the MMR vaccine?

**0:43:53 SS:** Yes, it's really disturbing. And in fact Zen Honeycutt, she is a good friend of mine, and she runs Moms Across America, and she's really

awesome. She's been really trying to get the message out about glyphosate being toxic, and so, she and I talked, and we've both said jeez, it could be in the vaccines, because the vaccines have gelatin. And gelatin comes from collagen and collagen has tons of glycine, and that's how I'm suspecting collagen. In fact, Anthony Samsel tested gelatin and found glyphosate in it. And then Anthony Samsel and Zen Honeycutt independently tested several vaccines, and they both found a consistent story between the two of them, independent tests. Anthony tested multiple samples of MMR with multiple mechanisms of testing and he found glyphosate consistently, and MMR had by far the most glyphosate in it compared to any other vaccine they tested.

**0:44:44 SS:** So it really stands out, glyphosate in MMR, and I think that may be a huge piece of the puzzle with respect to MMR causing autism. And it's quite remarkable, and again, I have come up with a mechanism by which MMR could cause autism if glyphosate is involved. It's really interesting, and that goes back to some research by professor Singh of Utah State University. They've been doing research since the 1990s. They had several papers where they showed that autistic kids had an over-reaction to the MMR vaccine. They had an over-exaggerated immune response to the MMR vaccine producing way more antibodies. Actually, the vaccine was phenomenally successful, they produced way more antibodies than normal kids, and then they also produced antibodies in the brain, which you're not supposed to because the brain is supposed to be protected, but the autistic kids were producing antibodies to MMR to this protein produced by the measles virus called hemagglutinin.

**0:45:45 SS:** And the brains of autistic kids were producing antibodies to hemagglutinin in the brain, and those antibodies were attacking the myelin

sheath. Molecular mimicry is a process by which proteins in invasive species match well with some segment of a protein in human protein, and the antibodies if they're working too hard, they get confused and they attack the human protein instead. So their theory was that the antibodies in the brain were attacking the myelin basic protein in the myelin sheath and destroying the myelin sheath, and it was triggered by the MMR vaccine through this process. Well, it turns out that particular sequence that matches, it's about, I don't know, maybe 18 or something amino acids, but there's three glycines in there that are onserved on both sides. So both of those proteins, the one in the myelin basic protein and the one in the hemagglutinin, that segment, three glycines that line up.

**0:46:37 SS:** And so those glycines have an opportunity to become glyphosate when the virus is being grown, so these are all live virus vaccines. Perhaps they're showing up in the live virus vaccines. Measle virus is grown on glyphosate, and it puts the glyphosate into the hemagglutinin, I'm suspecting, which makes it difficult to break down hemagglutinin and also makes it much more allergenic. So that could explain the whole thing right there. That's just that very nasty protein produced by the virus because it picked up glyphosate causing an over-exaggerated immune response and then wiping out the myelin sheath. I think that makes a lot of sense.

**0:47:09 CS:** Yes, I haven't heard that. That makes a lot of sense. And we're seeing this other phenomenon with a lot of the kiddos and children and young adults, and even adults--PANDAS and PANS, and how there's this kind of neuroinflammation and these antibodies with dopamine receptors and all of these parts of the neurons and things in the brain, and so I wonder if that mechanism crosses over, I'm just kind of thinking about other vaccine injuries

with stimulating that or just even glyphosate exposure is what you're saying as well.

**0:47:45 SS:** Yes, glyphosate in a vaccine to me seems absolutely horrendous, and in fact, Monsanto people are aware that when you inject glyphosate, it's much more toxic than if you take it orally. Zen Honeycutt is worrying about glyphosate in the COVID-19 vaccine, which I think is awesome. She just wrote something up and she has a place where you can sign up and try to send messages to the people who are developing these COVID-19 vaccines to say we demand that you test your vaccine for glyphosate because if they're going to force us to get this vaccine and it's got glyphosate in it, we're not going to be happy. Right?

**0:48:20 CS:** Forget it. Yes, I know, that's fascinating. Thank you for putting all that together, Stephanie, and I know we could talk all day, but I want to circle back. How does COVID-19 fit into the story, you were talking about how it might even be the acute cases or attempting to restore mitochondrial health, with what we're seeing with this piece.

**0:48:45 SS:** I'm glad you brought that up because that's quite an interesting story too. So basically, the innate immune system is broken by glyphosate because of those stalks that I told you about earlier, and then the adaptive immune system then goes on overdrive. This has been shown that in the lungs of the people who succumb, they get tons of cytokines being released by the immune system to try to fight the virus, because they can't trap it, because those traps are broken, and so you get all these cytokines which then cause inflammation and damage in the lungs, and that inflammation triggers a natural response, some signaling. It causes the body to up-regulate heme

oxygenase, and I think heme oxygenase is a major player in the cascade downward, and I think glyphosate is playing a major role there as well. In fact, it's quite interesting, heme oxygenase, I believe it's up-regulated for a process that can help to supply the mitochondria with deuterium depleted protons.

**0:49:43 SS:** Because it's really interesting when you look at the heme itself it is actually a really interesting molecule that plays incredibly important roles in the enzymes, but also its whole process of heme synthesis and heme degradation involve these enzymes that have NAD and FAD, flavoproteins, all this stuff, they're making deuterium depleted water. It's very, very interesting. And heme oxygenase produces a biliverdin, which then gets converted to bilirubin. And there's a bilirubin-biliverdin back and forth mechanism that I think is basically scrubbing and producing high-quality protons to supply to the mitochondria. These enzymes take place in the mitochondria, and they are working very hard to provide the mitochondria with deuterium-depleted water.

**0:50:23 SS:** So I think that it's a deuterium deficiency problem that's triggering this nasty response. The heme oxygenase gets up-regulated to try to help solve that problem, and the heme oxygenase of course is breaking down heme, so the red blood cells can't carry oxygen, so you get this kind of suffocation effect where you can't breathe because your red blood cells are losing their heme. But the really horrible thing--heme oxygenase normally actually resolves inflammation. It's been well established that heme oxygenase is a beneficial enzyme to have in a situation of inflammation, it'll resolve the inflammation. However, there's a mutation of glycine in heme oxygenase at a place where it binds heme that if that glycine is a bulkier or negatively charged amino acid, it's going to mess up heme and cause it to do the exact

opposite of what it's supposed to do, so there's papers that talk about that. So if that glycine is substituted by glyphosate and heme, it's going to turn it into a pro-oxidative rather than an antioxidative enzyme.

**0:51:20 SS:** And in fact, it normally releases Fe+2, ferrous ion, which gets then trapped in ferritin. Ferritin is up-regulated as well. This is all seen in COVID-19; up-regulation of ferritin, upregulation of heme oxygenase. The ferritin traps the iron, the Fe+2 ferrous ion, and so it's protected because iron is very toxic if it's loose, right? But when you have this glyphosate substitution for the glycine, it turns it into a pro-oxidant enzyme. Heme oxygenase does not succeed in changing heme into biliverdin, it doesn't do it. Instead, it releases Fe+4, ferrol iron, which is extremely toxic, which won't go into the ferritin, and it's going to be this ferrol iron loose in your body, which is going to make the inflammatory situation go on fire, so you get this incredible vascular inflammation response, which is what you see in these COVID-19 patients. And then they get into coagulation because this situation is such a panic for the body that it starts making blood clots, and then you get multiple organ failure because you have all these blood clots in the organ. So it's a really horrible cascade that happens, I think in part because glyphosate is getting into heme oxygenase and causing it to be the reverse of what it would normally be.

**0:52:34 CS:** That's fascinating. Especially when we're looking at COVID treatments, we have to understand this mechanism, I think, more greatly to give people the right tools when they are in crisis. I think we're still navigating appropriate treatment. Obviously, I don't work in a hospital, but we're just standing on the sidelines just hoping that some of this message gets to the people treating these patients, that they just have more tools and this other

mechanism to think about in recovering people. Because, obviously, the ventilator situation isn't the solution or helpful. Well, Stephanie, I could ask you a thousand more questions, is there anything else on your mind that you didn't get to share?

**0:53:19 SS:** We covered a lot, actually. I'm sure people are a little overwhelmed. We hit a lot of hot topics...

**0:53:27 SS:** And of course, sunlight. I always like to say sunlight. Get out in the sun, making that natural vitamin D. Vitamin D is really helpful for your immune system. You need to boost your innate immune system. That's the most important thing you can do to protect from COVID-19. And also, I think eating lots of herbs and spices. They carry molecules that are going to help to transport sulfate and solve the deuterium problem. So I think eating herbs and spices is also good.

**0:53:53 CS:** Absolutely.

**0:53:54 SS:** Flavonoids--they're molecules that help to make that proton tunneling stuff work. So they're going to help you deplete deuterium. That's a good reason, I think, why herbs and spices are healthy for you, along with the healthy fats. Eat the fats to and of course, glacier water, if you can get a hold of water that's naturally depleted, that's good too.

**0:54:19 CS:** I know we're starting to look at the water conversation. There's so many waters to think about, structured water...

**0:54:26 SS:** I know. Actually, hydrogen water. Hydrogen water may be a way to get low deuterium. I wonder about that because hydrogen gas...I know the gut microbes make a very, very low deuterium hydrogen gas, and that's partly because hydrogen leaves more easily than deuterium does. Deuterium is heavy, so whenever you go into the gas phase, you're going to get deuterium depletion of the hydrogen. So I'm suspecting hydrogen gas, which is a lot cheaper than deuterium-depleted hydrogen water, which is a lot cheaper than deuterium-depleted water, may be a good way to improve your deuterium situation.

**0:54:58 CS:** I've been wondering that. I've been asking Petra and László the same thing, and I think we're all just putting the pieces together, but the cool thing is more people who are aware can share their deuterium levels in the water. You can also get that tested. So if you have a great water source or you're curious and want to know, you can get the deuterium levels tested and then glyphosate, of course, tested in the water. There's more tests coming out where you can not only test your body but also your food and your water and glyphosate. I think those things are really important to know. And then the other comment I just wanted to mention, as you already said, is that with these high-fat diets or the ketogenic diet...probably one of the most valuable mechanisms may be the deuterium diet.

**0:55:42 SS:** Yes. A lot cheaper than deuterium water.

**0:55:44 CS:** I know. Deuterium water...If someone has no cancer or something, I obviously understand that level of therapeutic intervention, but it's a lot, especially when everybody is doing all these other things for their health,

it's a lot. And as you mentioned, there's probably a place where that becomes a diminishing return...

**0:56:00 SS:** Right. You don't want to just deplete deuterium. You want to fix the whole deuterium movement problem that's messed up by glyphosate. So you really need to try to get rid of glyphosate. And one thing I will say is, in driving, you should avoid the highway. I already did go the back roads, but now I do so more religiously because the highway is dangerous if there's glyphosate being released by all those vehicles on the highway.

**0:56:21 CS:** Wow. We've put some of those correlations together with air pollution--if you live towards the highway, there's more incidences of asthma and other health conditions.

**0:56:34 SS:** And it has been shown that the biodiesel fuel is more inflammatory than normal diesel fuel. Studies repeatedly have shown that it's inflammatory. They had hoped that it would be actually better and I think they were somewhat surprised to find that it was worse, but when they did these studies, they found out that it was not...Biodiesel fuel is not good. It releases nitrogen oxides which are also really bad for climate change. So it's not clear that it's helping climate change. At least it releases a lot more nitrogen oxides than diesel fuel does.

**0:57:06 CS:** We have to keep coming back to the drawing board of what are going to be the alternative fuel sources. Maybe this was well-intended but obviously we have to think of a new way for sure.

**0:57:16 SS:** It could be that it's fine, as long as there isn't glyphosate in it. It could be if we were using organic agriculture to harvest.

**0:57:23 CS:** Imagine that, right? I guess lots of questions about chlorine dioxide, protocols for glyphosate, and so forth, but I think just to maybe give people some other tangible tools, do you have a favorite glyphosate test? We've been using Great Plains.

**0:57:39 SS:** Yes, Great Plains is good.

**0:57:41 CS:** We test a lot of different environmental toxicants in the body, especially heavy metals, and we have to do these provocation tests, and we're really always saying this is just a snapshot of the body, it's not always indicative of where we have things stored.

**0:57:56 SS:** Right. That's certainly true for glyphosate. And also, the test can be flawed because if glyphosate's in the proteins, if it doesn't get released from the proteins, it'll be missed. I think that's one big problem with testing glyphosate in proteins and in fact, Monsanto's own researchers found that out. They did a radiolabeled glyphosate experiment and they found glyphosate in the tissue. They found radiolabel in the tissues, and they could only account for 20% of the radiolabel as glyphosate. Once they added these enzymes, they break down the proteins into individual amino acids, the yield got much higher. They got 70% of the radiolabel recovered as glyphosate. So I think that's a huge problem with glyphosate levels in proteins, that we're missing a lot of the glyphosate because it's embedded in the protein because it's substituting for glycine.

**0:58:37 CS:** I almost see this visualization that we all might not want to see how much glyphosate lights up in our body...

**0:58:44 SS:** Oh, I know. If we could just see it. If we had some way to actually see it.

**0:58:49 SS:** Yes, that would be amazing. And they are working on some exotic ways to test for glyphosates in foods and I'm hoping they will come up with a device that you could buy that wouldn't be too expensive. It'd be wonderful. You could kind of go shine some light on the Cheerios to see if they have glyphosate in them and then not buy them, because they do. That would be so amazing if we could come up with something like that.

**0:59:09 CS:** Innovation, that's what always gives me hope whenever there's a problem like this, and bright minds and people continuing to collaborate. That might be in our future, Stephanie, I'm all for that.

**0:59:20 SS:** Yes, that would be great.

**0:59:23 CS:** Well, I want to be respectful of your time. It's already noon and I know that you just gave us so much information and I'm sure people are going to have to listen to the recording again which we will send out, to digest it. I can't say enough how grateful we are to you and your work. And you've helped us really just have this whole other clinical insight for our patients that we wouldn't have had if you hadn't been so influential. So I just want to thank you for everything you do.

**0:59:49 SS:** And I want to thank you as well for the work you're doing. It's so important. Clinicians like you, boots on the ground, who are trying to figure out how to heal people. It's just wonderful what work you're doing, it's very heroic.

**0:59:58 CS:** Oh, thank you, Stephanie. Well, it's a team effort, and again, we're so grateful for your time. Please go enjoy the sunshine and the beautiful day ahead, and I'll be in touch. And for everybody who is listening, we'll send out the recording.

**1:00:22 SS:** Great. Thank you so much for having me, this was great.

**1:00:25 CS:** Thank you, Stephanie. Bye, everyone.